SMART Approach to Increasing Communication Outcomes in ASD

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Core Deficit: Social Communication in Children with ASD

- Social Communication is core deficit in ASD
- Communication interventions have been successful in improving outcomes for some but not all children with ASD
- Critical area for research and for innovative designs that advance our understanding of how to best sequence interventions.
Minimally Verbal Children with Autism

- Between 25-30% of children with autism remain minimally verbal by school age (Kasari et al, 2013; Anderson 2009)
- Most of these children are not “nonverbal”
  - Very low rates of verbalization
  - Limited diversity
  - Single words, rote phrases
- Relatively unstudied population
- Few intervention studies
  - No randomized trials with school age children
  - Pickett et al (2009) review of 167 case studies
    - Positive results for relatively younger (5-7 yrs) and higher IQ (>50)
    - Primarily ABA discrete trial type interventions
    - 70% of individuals increase in words; 30% increase in phrases or sentences
Specific Aims of the Study

- Goal: To construct an adaptive intervention that utilized a naturalistic behavioral communication intervention (JASPER + EMT) with the added variation of an SGD with minimally verbal school aged children with ASD

- Aim 1: To examine the effect of the adaptive intervention beginning with JASP+EMT+SGD versus the adaptive interventions beginning with JASP+EMT verbal only

- Aim 2: To compare the outcomes of three adaptive interventions
Criteria for Minimally Verbal Participants

- Less than 20 spontaneous words
- Ages 5-8 years
- Minimum of 24 months cognition (Leiter) and receptive language (PPVT)
- Diagnosis of autism or ASD
- 2 years previous treatment
- No fluent use of AAC
Study Participants

- 61 minimally verbal children diagnosed with autism
  - 60 met ADOS criteria for autism
  - Mn ADOS score 19.55 (SD 4.27)

- 51 males; 10 females
- 48% white, 23% African American, 19% Asian American, 5% Hispanic, 5% other
- Mn age 6.31 years (SD 1.16)

- Mn unique words: 16.62 (SD 14.65)
- Mn PPVT-4: 2.72 years (SD .68)
- Mn Nonverbal Cognitive (Leiter): 68.18 (SD 18.68); range 36 - 130
Sequential multiple assignment randomized trial (SMART) Design

**Initial Randomization**
- **JAE/EMT+AAC**
  - 2 sessions per week
  - 12 weeks
  - 45-60 minute sessions
  - **n=63**
- **JAE/EMT**
  - 2 sessions per week
  - 12 weeks
  - 45-60 minute sessions
  - **n=31**

**Decide Responder Status: Assessments n=55**
- **Responder** **n=22**
- **Non-Responder** **n=6**

**Months 4–6**
- **JAE/EMT+AAC**
  - 2 sessions per week
  - 12 weeks
  - 45-60 minute sessions
  - **n=32**
- **Increased Intensity**
  - **JAE/EMT+AAC**
    - 2.5-3 hours per week
    - 12 weeks
    - **n=6**
- **JAE/EMT**
  - 2 sessions per week
  - 12 weeks
  - 45-60 minute sessions
  - **n=16**
- **Increased Intensity**
  - **JAE/EMT**
    - 2.5-3 hours per week
    - 12 weeks
    - **n=5**
- **JAE/EMT+AAC**
  - 2 sessions per week
  - 12 weeks
  - 45-60 minute sessions
  - **n=6**

**3-Month Follow-Up Assessments n=51**
= randomization;
JASP = joint attention/engagement and social play
EMT = enhanced milieu teaching treatment
SGD = speech generating device (an AAC)
Intervention

- **Blended JASP+ EMT**
  - Joint Attention, Symbolic Play and Emotion Regulation (JASP; Kasari et al 2006)
  - Naturalistic, interactive, play based
  - Model and prompt joint attention, symbolic play, and verbal and nonverbal communication contingent on child’s interests and responses
  - Goals: increase engagement, social initiations, symbolic play and social communication, especially commenting
- **JASP+ EMT Spoken Language Only**
- **JASP +EMT + SGD**
SGD in JASP-EMT

- SGD available to the child
- Programmed pages for toys sets
- Used communicatively with the child
  - 50% of adult utterance
  - 70% of adult expansions
- Child could respond to prompts with either SGD or spoken language
- Embedded in JASPER-EMT interactions; focus on social use
Intervention Implementation

- **Phase 1**
  - 24 40-minute sessions in clinic play room
  - Parents watched most sessions
  - 4-6 toys sets preferred by child
  - Primary comparison JASP + EMT (spoken) vs. JASP + EMT + SGD

- **Phase 2**
  - 24 40-minute sessions in clinic play room
  - Parents trained in sessions (Teach, model, coach, review)
    - Parents taught JASP + EMT
    - Parents taught use of SGD
  - 4-6 toys sets preferred by child
  - Treatment variations:
    - JASP + EMT (spoken)
    - JASP + EMT + SGD
    - Intensified JASP + EMT
    - JASP + EMT + SGD
    - Intensified JASP + EMT + SGD
  - Non-responders were reassigned to one of these
## Early Responder

≥25% improvement on 7 or more of the following variables

<table>
<thead>
<tr>
<th>Session Data (Mn Sessions 1/ 2 vs Mn Sessions 23/ 24)</th>
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<tr>
<td>• Total Social Communicative Utterances</td>
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<tr>
<td>• Percentage Communicative Utterances</td>
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<td>• Number Different Word Root</td>
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<td>• Unique Word Combinations</td>
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<th>Language Sample (Screening vs 12 weeks)</th>
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Results

• **Aim 1:** To examine the effect of the adaptive intervention beginning with JASP+EMT+SGD versus the adaptive interventions beginning with JASP+EMT verbal only

• **Spontaneous Communicative Utterances** *(spoken or AAC)*

• **Midpoint (12 weeks of intervention)**
  - JAE/EMT + AAC > JAE/EMT
    - More social communicative utterances (SCU) \(d= .76, p <0.01\)
    - Percentage of communicative utterances \(d=.59, p = 0.02\)

• **End of Treatment (24 weeks of intervention)**
  - JAE/EMT + AAC > JAE/EMT
    - More social communicative utterances \(d=.60, p =0.02\)
    - Percentage of communicative utterances \(d=.75, p > 0.01\)
Primary aim results for the primary outcome (TSCU).

Open plotting characters denote observed means; closed denote model-estimated means. Error bars denote 95% confidence intervals for the model-estimated means.
Results

- **AIM 1**

- **Secondary outcome measures**
  - Greater percentage of participants in the JASP + EMT+ SGD group (77%) were early treatment responders than in the JASP + SGD group (62%)

  - Participants in the JASP + EMT+ SGD group had:
    - greater Number of Different Word Roots (NDW),
    - more comments (COM) than participants in JASP+ EMT group
Outcomes 12, 24 & 36 weeks

JASP+EMT (spoken only)

JASP + EMT + SGD

TSCU  TDW  TCOM
Results

- **Aim 2**: To compare the outcomes of three adaptive interventions

  - Adaptive interventions beginning with JASP+EMT+SGD and intensified JASP+EMT+SGD had the greatest impact on SCU at 24 and 36 weeks (MN 58.5 vs 52.5) \((p<.05)\)

  - Adaptive interventions which augmented JASP+EMT with SGD led to greater SCU than the adaptive intervention which intensified JASP+EMT (MN 42.7 vs 39.6) \(\text{(NS)}\)
Summary

• Using blended JASP-EMT, minimally verbal children can make significant progress in social communication after age 5
• Children gain more in SCU, NDW and comments when they begin JASP-EMT treatment with an AAC device
• Children who were slow responders, gained more in SCU when adapted interventions included SGD
• AAC device can be effective when used within the context of a naturalistic intervention teaching foundations of communication with others
• Results persist over time, but differences between groups are attenuated at followup; suggesting both approaches may have long term benefits
Future Research

• Promising results, need replication
• Small N for adapted treatments; comparisons should be interpreted with caution
• Ongoing NIH-ACE study extends current study to larger sample and compares to DTT
• Research is needed to determine the potential for developing spoken language in minimally verbal children
  • Relate to benchmarks for communication development
  • Extend adaptation to include additional active ingredients of effective treatment
  • Use of SMART design to continue studying adaptations
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